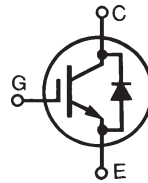


# HiPerFAST™ IGBT with Diode ISOPLUS247™

## IXGR 32N60CD1

$V_{CES} = 600 \text{ V}$   
 $I_{C25} = 45 \text{ A}$   
 $V_{CE(SAT)} = 2.7 \text{ V}$   
 $t_{fi(typ)} = 55 \text{ ns}$

(Electrically Isolated Backside)

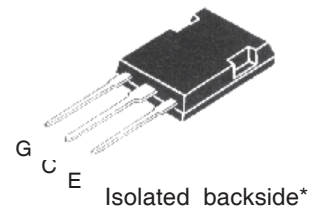


Preliminary data sheet

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	600	V
$V_{CGR}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	45	A
$I_{C90}$	$T_C = 90^\circ\text{C}$	28	A
$I_{CM}$	$T_C = 25^\circ\text{C}, 1 \text{ ms}$	120	A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load, $L = 100 \mu\text{H}$	$I_{CM} = 64$ @ $0.8 V_{CES}$	A
$P_c$	$T_C = 25^\circ\text{C}$	140	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
Maximum Lead and Tab temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
$V_{ISOL}$	50/60 Hz, RMS $t = 1 \text{ min leads-to housing}$	2500	V~
<b>Weight</b>		5	g

ISOPLUS247™ (IXGR)

E 153432



G = Gate, C = Collector,  
E = Emitter, TAB = Collector

\* Patent pending

### Features

- DCB Isolated mounting tab
- Meets TO-247AD package Outline
- High current handling capability
- Latest generation HDMOS™ process
- MOS Gate turn-on - drive simplicity

### Applications

- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

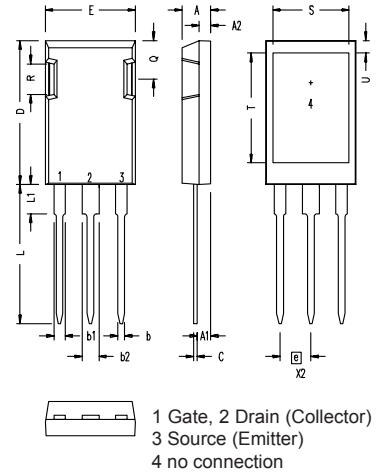
### Advantages

- Easy assembly
- High power density
- Very fast switching speeds for high frequency applications

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$	2.5		5.0 V
$I_{CES}$	$V_{CE} = 600\text{V}$ $V_{GE} = 0 \text{ V}$		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	200 $\mu\text{A}$ 3 mA
$I_{GES}$	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_T, V_{GE} = 15 \text{ V}$ Note 1		2.3	2.7 V

Symbol	Test Conditions	Characteristic Values			
		(T <sub>J</sub> = 25°C, unless otherwise specified)			
		min.	typ.	max.	
<b>g<sub>fs</sub></b>	I <sub>C</sub> = I <sub>T</sub> ; V <sub>CE</sub> = 10 V, Pulse test, t ≤ 300 μs, duty cycle ≤ 2 %		25	S	
<b>C<sub>ies</sub></b>	V <sub>CE</sub> = 25 V, V <sub>GE</sub> = 0 V, f = 1 MHz		2700	pF	
<b>C<sub>oes</sub></b>			240	pF	
<b>C<sub>res</sub></b>			50	pF	
<b>Q<sub>g</sub></b>	I <sub>C</sub> = I <sub>T</sub> , V <sub>GE</sub> = 15 V, V <sub>CE</sub> = 0.5 V <sub>CES</sub>		110	nC	
<b>Q<sub>ge</sub></b>			22	nC	
<b>Q<sub>gc</sub></b>			40	nC	
<b>t<sub>d(on)</sub></b>	<b>Inductive load, T<sub>J</sub> = 25°C</b> I <sub>C</sub> = I <sub>T</sub> , V <sub>GE</sub> = 15 V, L = 100 μH, V <sub>CE</sub> = 0.8 V <sub>CES</sub> , R <sub>G</sub> = R <sub>off</sub> = 4.7 Ω Remarks: Switching times may increase for V <sub>CE</sub> (Clamp) > 0.8 • V <sub>CES</sub> , higher T <sub>J</sub> or increased R <sub>G</sub>		25	ns	
<b>t<sub>ri</sub></b>			20	ns	
<b>t<sub>d(off)</sub></b>			85	170	ns
<b>t<sub>fi</sub></b>			55		ns
<b>E<sub>off</sub></b>			0.32	0.75	mJ
<b>t<sub>d(on)</sub></b>	<b>Inductive load, T<sub>J</sub> = 125°C</b> I <sub>C</sub> = I <sub>T</sub> , V <sub>GE</sub> = 15 V, L = 100 μH V <sub>CE</sub> = 0.8 V <sub>CES</sub> , R <sub>G</sub> = R <sub>off</sub> = 4.7 Ω Remarks: Switching times may increase for V <sub>CE</sub> (Clamp) > 0.8 • V <sub>CES</sub> , higher T <sub>J</sub> or increased R <sub>G</sub>		25	ns	
<b>t<sub>ri</sub></b>			25	ns	
<b>E<sub>on</sub></b>			1		mJ
<b>t<sub>d(off)</sub></b>			110		ns
<b>t<sub>fi</sub></b>			100		ns
<b>E<sub>off</sub></b>		0.85		mJ	
<b>R<sub>thJC</sub></b>				0.90 K/W	
<b>R<sub>thCK</sub></b>			0.15	K/W	

### ISOPLUS 247 OUTLINE



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A <sub>1</sub>	2.29	2.54	.090	.100
A <sub>2</sub>	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b <sub>1</sub>	1.91	2.13	.075	.084
b <sub>2</sub>	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	.244
R	4.32	4.83	.170	.190

Symbol	Test Conditions	Characteristic Values		
		(T <sub>J</sub> = 25°C, unless otherwise specified)		
		min.	typ.	max.
<b>V<sub>F</sub></b>	I <sub>F</sub> = I <sub>T</sub> , V <sub>GE</sub> = 0 V, Pulse test t ≤ 300 μs, duty cycle d ≤ 2 %			1.6 V 2.5 V
<b>I<sub>RM</sub></b>	I <sub>F</sub> = I <sub>T</sub> , V <sub>GE</sub> = 0 V, -di <sub>F</sub> /dt = 100 A/μs V <sub>R</sub> = 100 V I <sub>F</sub> = 1 A; -di <sub>F</sub> /dt = 100 A/μs; V <sub>R</sub> = 30 V		6	A
<b>t<sub>rr</sub></b>			100	ns
			25	ns
<b>R<sub>thJC</sub></b>				1.15 K/W

Note: 1. I<sub>T</sub> = 32A

IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065B1	6,683,344	6,727,585
	4,850,072	5,017,508	5,063,307	5,381,025	6,259,123B1	6,534,343	6,710,405B2	
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	

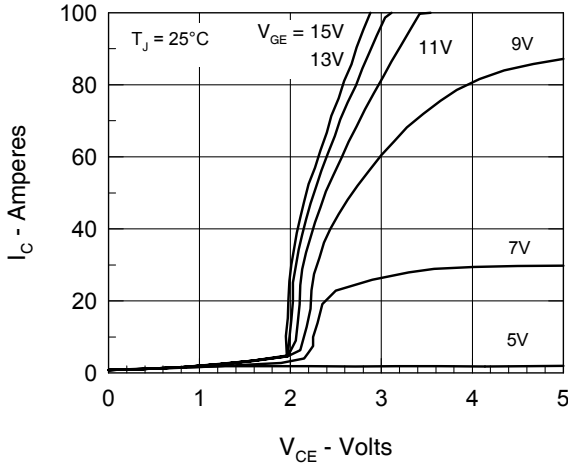


Fig. 1. Output Characteristics

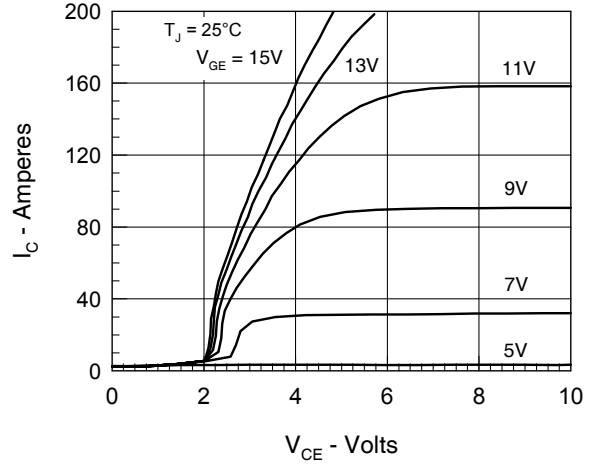


Fig. 2. Extended Output Characteristics

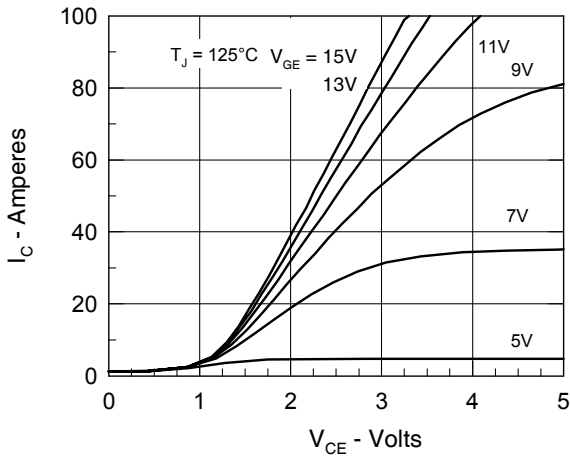


Fig. 3. High Temperature Output Characteristics

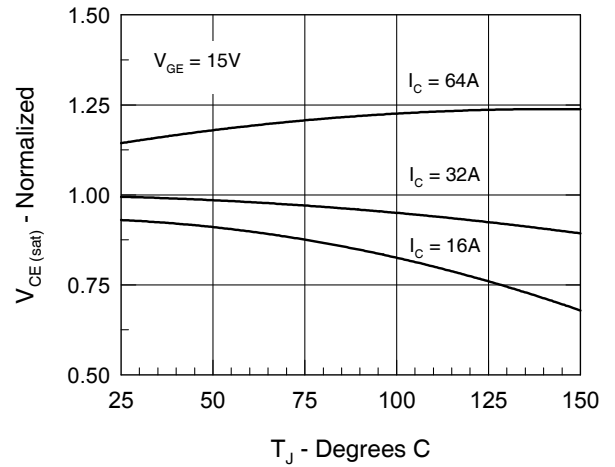


Fig. 4. Temperature Dependence of  $V_{CE(sat)}$

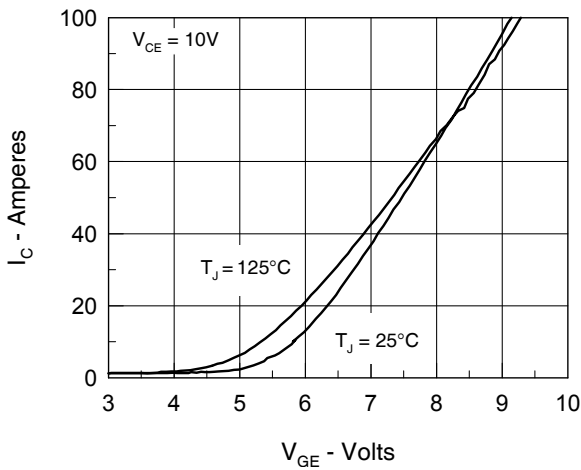


Fig. 5. Admittance Curves

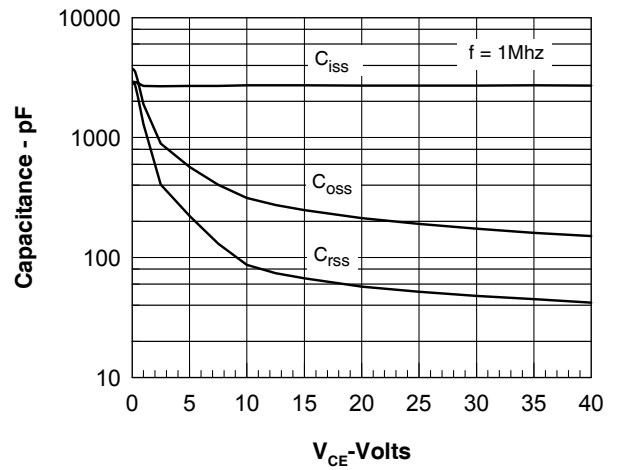


Fig. 6. Capacitance Curves

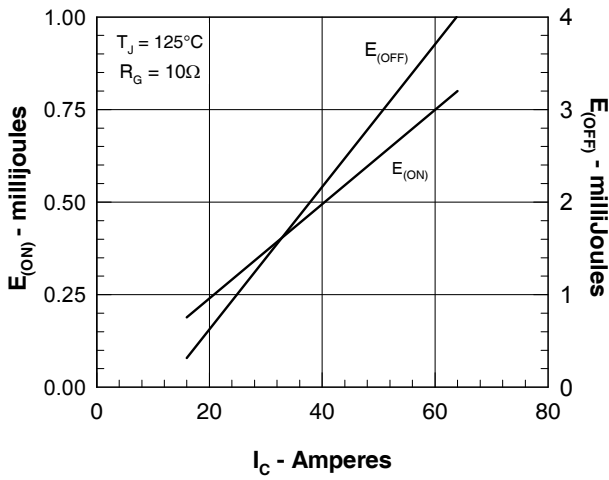


Fig. 7. Dependence of  $E_{ON}$  and  $E_{OFF}$  on  $I_C$ .

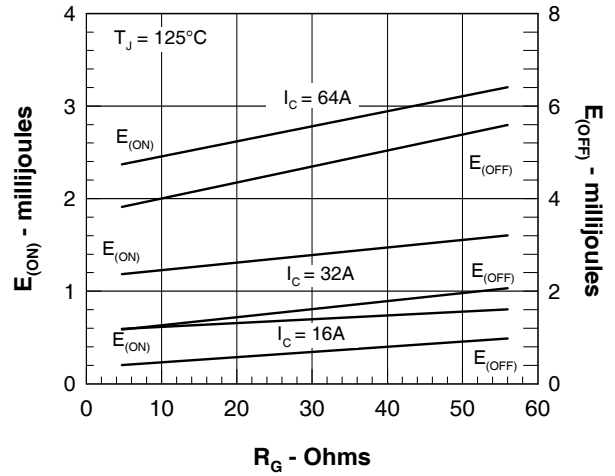


Fig. 8. Dependence of  $E_{ON}$  and  $E_{OFF}$  on  $R_G$ .

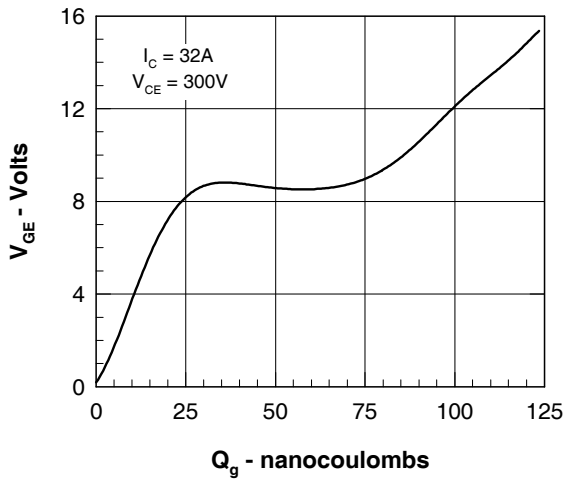


Fig. 9. Gate Charge

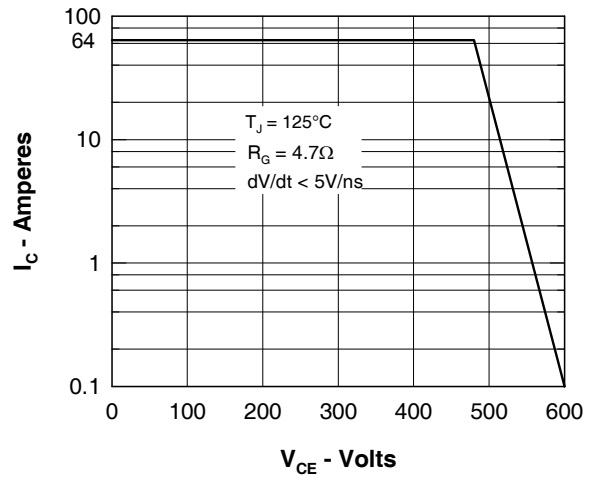


Fig. 10. Turn-off Safe Operating Area

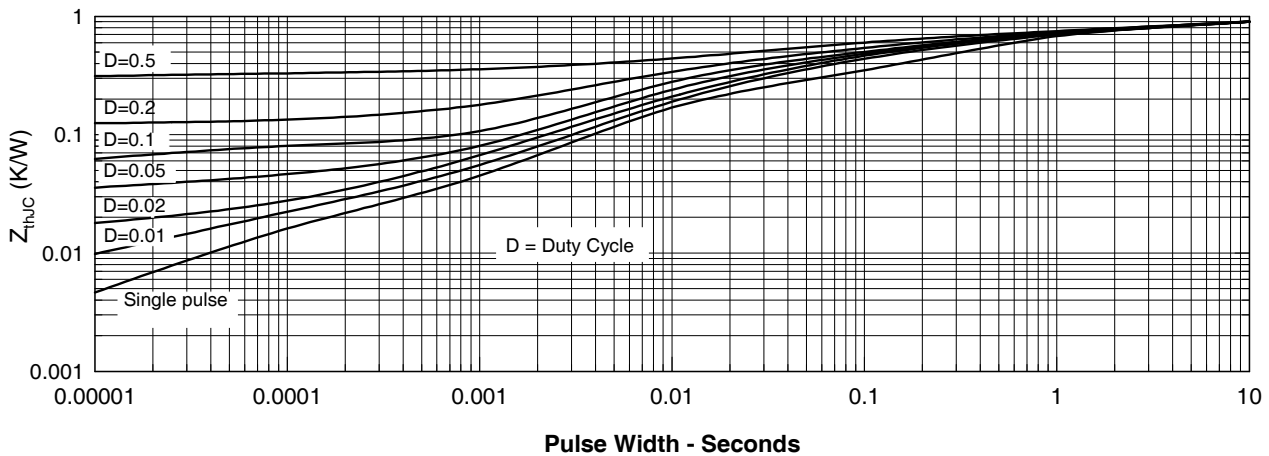


Fig. 11. Transient Thermal Resistance

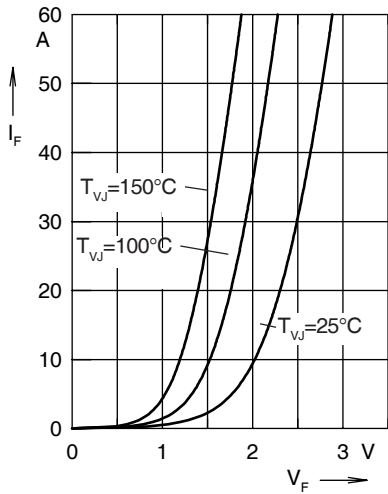


Fig. 12. Forward current  $I_F$  versus  $V_F$

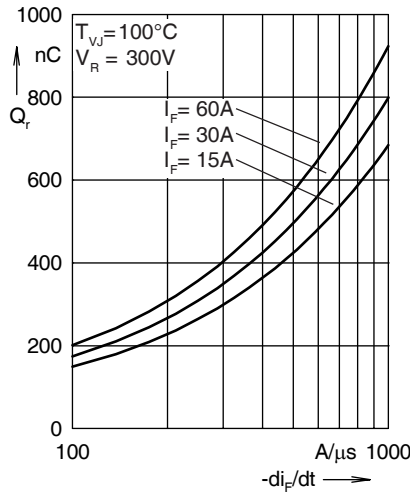


Fig. 13. Reverse recovery charge  $Q_r$  versus  $-di_F/dt$

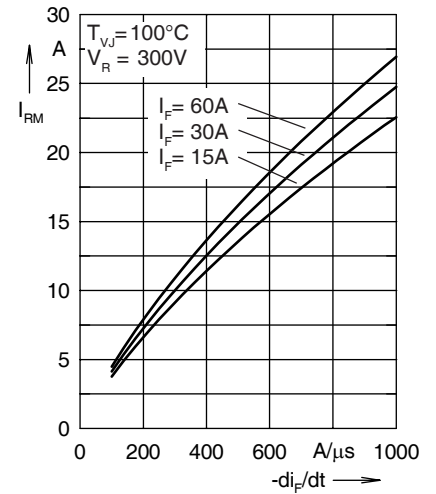


Fig. 14. Peak reverse current  $I_{RM}$  versus  $-di_F/dt$

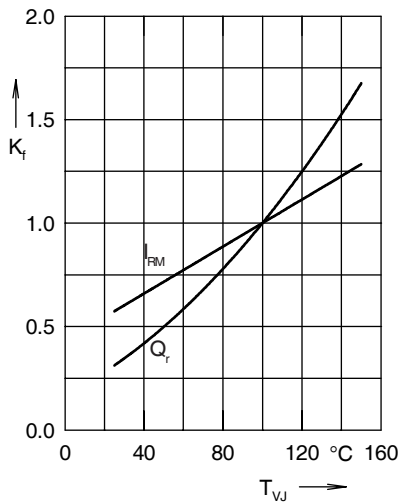


Fig. 15. Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

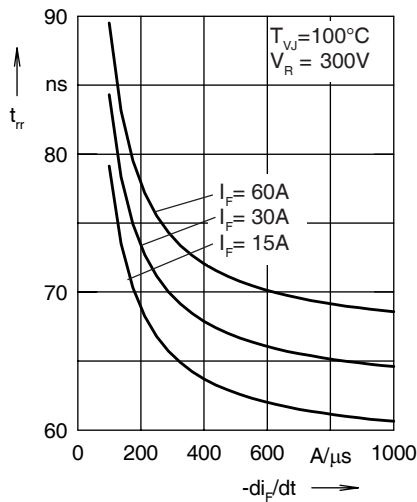


Fig. 16. Recovery time  $t_{tr}$  versus  $-di_F/dt$

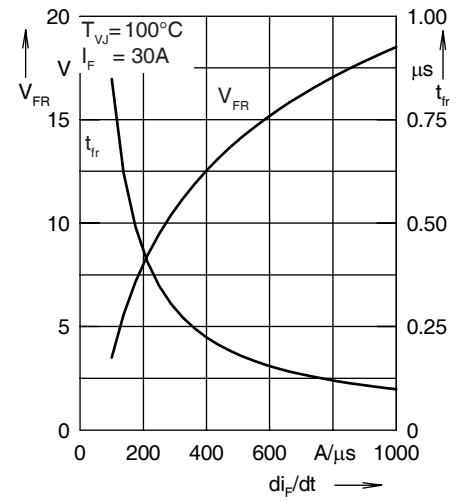


Fig. 17. Peak forward voltage  $V_{FR}$  and  $t_{tr}$  versus  $di_F/dt$

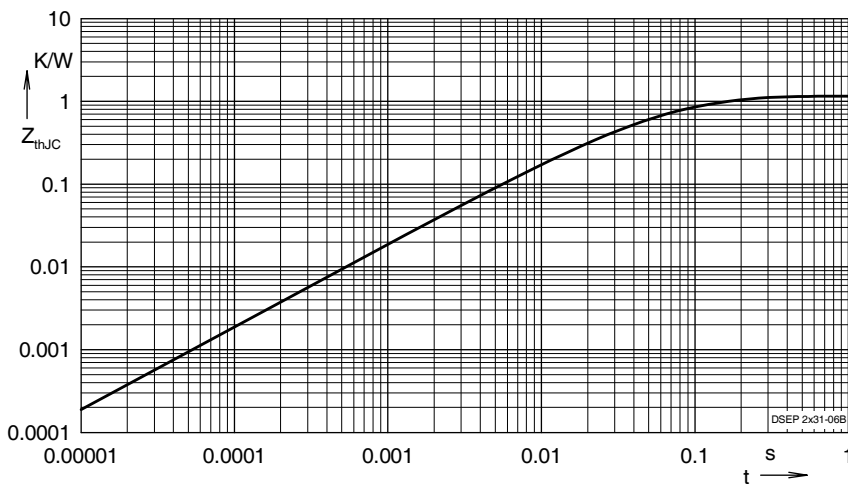


Fig. 18. Transient thermal resistance junction to case

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.436	0.0055
2	0.482	0.0092
3	0.117	0.0007
4	0.115	0.0418